

04-17-00

A

Practitioner's Docket No. P9169

PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application  
 Assistant Commissioner for Patents  
 Washington, D.C. 20231

## NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of  
 Inventor(s): WALLACE H. PETERSON

**WARNING:** 37 C.F.R. § 1.41(a)(1) points out:

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors."

For (title): SPACER FRAME BAR FOR INSULATED WINDOW

## CERTIFICATION UNDER 37 C.F.R. 1.10\*

(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date 13 April 2000 in an envelope as "Express Mail Post Office to Addressee," mailing Label Number E1551066248US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Phyllis L. Huggins

(type or print name of person mailing paper)

[Signature]  
 Signature of person mailing paper

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**\*WARNING:** Each paper or fee filed by "Express Mail" must have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

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04/13/00  
 Jc781 U.S. PTO

Jc530 U.S. PTO  
 09/548518  
 04/13/00

04/13/00  
 Jc530 U.S. PTO  
 09/548518  
 04/13/00

## 1. Type of Application

This new application is for a(n)

(check one applicable item below)

- ☒ Original (nonprovisional)  
☐ Design  
☐ Plant

**WARNING:** Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. § 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

**WARNING:** Do not use this transmittal for the filing of a provisional application.

**NOTE:** If one of the following 3 items apply, then complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED** and a **NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION**.

- ☐ Divisional.  
☐ Continuation.  
☐ Continuation-in-part (C-I-P).

## 2. Benefit of Prior U.S. Application(s) (35 U.S.C. §§ 119(e), 120, or 121)

**NOTE:** A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. § 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(f) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

**NOTE:** If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED**.

**WARNING:** If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. §§ 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. §§ 120, 121 or 365(c). (35 U.S.C. § 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. §§ 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.

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**WARNING:** When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application **must** be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).

- ☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

### 3. Papers Enclosed

- A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

32 Pages of specification

6 Pages of claims

9 Sheets of drawing

**WARNING:** **DO NOT** submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. § 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).

**NOTE:** "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. § 1.84(c)).

(complete the following, if applicable)

- ☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. § 1.84(b).
- ☐ formal
- ☐ informal

### B. Other Papers Enclosed

7 Pages of declaration and power of attorney

1 Pages of abstract

   Other

### 4. Additional papers enclosed

- ☐ Amendment to claims
- ☐ Cancel in this applications claims \_\_\_\_\_ before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)
- ☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)
- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement (37 C.F.R. § 1.98)
- ☐ Form PTO-1449 (PTO/SB/08A and 08B)
- ☐ Citations

- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☐ Other

**5. Declaration or oath (including power of attorney)**

**NOTE:** A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d)(1)-(3).

**NOTE:** A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name including family name and at least one given name, without abbreviation together with any other given name or initial, and the residence, post office address and country or citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. § 1.63(a)(1)-(4).

**NOTE:** "The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.62, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(i) is filed supplying or changing the name or names of the inventor or inventors." 37 C.F.R. § 1.41(a)(1).

☒ Enclosed (unsigned)  
Executed by

(check all applicable boxes)

- ☐ inventor(s).
- ☐ legal representative of inventor(s).  
37 C.F.R. §§ 1.42 or 1.43.
- ☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.
  - ☐ This is the petition required by 37 C.F.R. § 1.47 and the statement required by 37 C.F.R. § 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

**NOTE:** Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

- ☐ Application is made by a person authorized under 37 C.F.R. § 1.41(c) on behalf of all the above named inventor(s).

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(The declaration or oath, along with the surcharge required by 37 C.F.R. § 1.16(e) can be filed subsequently).

- ☐ Showing that the filing is authorized.  
(not required unless called into question. 37 C.F.R. § 1.41(d))

## 6. Inventorship Statement

**WARNING:** If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☒ The same.

or

- ☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,
- ☐ is submitted.
- ☐ will be submitted.

## 7. Language

**NOTE:** An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 C.F.R. § 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. § 1.52(d).

- ☒ English
- ☐ Non-English
- ☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. § 1.52(d).

## 8. Assignment

- ☐ An assignment of the invention to \_\_\_\_\_
- ☐ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.
- ☐ will follow.

**NOTE:** "If an assignment is submitted with a new application, send two separate letters—one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

**WARNING:** A newly executed "CERTIFICATE UNDER 37 C.F.R. § 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

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## 9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

- ☐ is (are) attached.  
☐ will follow.

**NOTE:** The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. § 1.55(a) and 1.63.

**NOTE:** This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. § 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

## 10. Fee Calculation (37 C.F.R. § 1.16)

- A. ☐ Regular application

CLAIMS AS FILED						
Number filed			Number Extra		Rate	Basic Fee 37 C.F.R. § 1.16(a) \$690.00
Total						
Claims (37 C.F.R. § 1.16(c))	33	- 20 =	13	×	\$ 18.00	334.00
Independent						
Claims (37 C.F.R. § 1.16(b))	2	- 3 =	Ø	×	\$ 78.00	
Multiple dependent claim(s), if any (37 C.F.R. § 1.16(d))						
				+	\$260.00	

- ☐ Amendment cancelling extra claims is enclosed.  
☐ Amendment deleting multiple-dependencies is enclosed.  
☐ Fee for extra claims is not being paid at this time.

**NOTE:** If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. § 1.16(d).

Filing Fee Calculation \$ 1,024.00

- B. ☐ Design application  
(\$310.00—37 C.F.R. § 1.16(f))

Filing Fee Calculation \$

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- C. ☐ Plant application  
(\$480.00—37 C.F.R. § 1.16(g))

Filing fee calculation

\$ \_\_\_\_\_

# 11. Small Entity Statement(s)

- ☒ Statement(s) that this is a filing by a small entity under 37 C.F.R. § 1.9 and 1.27 is (are) attached.

**WARNING:** "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. § 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

**WARNING:** "Small entity status must not be established when the person or persons signing the . . . statement can **unequivocally** make the required self-certification." M.P.E.P., § 509.03, 6th ed., rev. 2, July 1996 (emphasis added).

(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application  
\_\_\_\_\_ / \_\_\_\_\_, filed on \_\_\_\_\_, from which benefit is being claimed for this application under:

- 35 U.S.C. § ☐ 119(e),  
☐ 120,  
☐ 121,  
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)

\$ 512.00

**NOTE:** Any excess of the full fee paid will be refunded if small entity status is established and a refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under § 1.136. 37 C.F.R. § 1.28(a).

# 12. Request for International-Type Search (37 C.F.R. § 1.104(d))

(complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.

**13. Fee Payment Being Made at This Time**

☐ Not Enclosed

☐ No filing fee is to be paid at this time.

*(This and the surcharge required by 37 C.F.R. § 1.16(e) can be paid subsequently.)*

☒ Enclosed

☒ Filing fee

\$ 512.00

☐ Recording assignment

(\$40.00; 37 C.F.R. § 1.21(h))

(See attached "COVER SHEET FOR  
ASSIGNMENT ACCOMPANYING NEW  
APPLICATION".)

\$ \_\_\_\_\_

☐ Petition fee for filing by other than all the  
inventors or person on behalf of the inventor  
where inventor refused to sign or cannot be  
reached

(\$130.00; 37 C.F.R. §§ 1.47 and 1.17(i))

\$ \_\_\_\_\_

☐ For processing an application with a  
specification in  
a non-English language

(\$130.00; 37 C.F.R. §§ 1.52(d) and 1.17(k))

\$ \_\_\_\_\_

☐ Processing and retention fee

(\$130.00; 37 C.F.R. §§ 1.53(d) and 1.21(l))

\$ \_\_\_\_\_

☐ Fee for international-type search report

(\$40.00; 37 C.F.R. § 1.21(e))

\$ \_\_\_\_\_

**NOTE:** 37 C.F.R. § 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. § 1.53(f) and this, as well as the changes to 37 C.F.R. §§ 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(l) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed

\$ 512.00

**14. Method of Payment of Fees**

☒ Check in the amount of \$ 512.00

☐ Charge Account No. \_\_\_\_\_ in the amount of  
\$ \_\_\_\_\_

A duplicate of this transmittal is attached.

**NOTE:** Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. § 1.22(b).

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**15. Authorization to Charge Additional Fees**

**WARNING:** If no fees are to be paid on filing, the following items should not be completed.

**WARNING:** Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 08-1254:

☒ 37 C.F.R. § 1.16(a), (f) or (g) (filing fees)

☒ 37 C.F.R. § 1.16(b), (c) and (d) (presentation of extra claims)

**NOTE:** Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

☐ 37 C.F.R. § 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)

☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a)).

☐ 37 C.F.R. § 1.17 (application processing fees)

**NOTE:** “. . . A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission.” 37 C.F.R. § 1.136(a)(3).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

**NOTE:** Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

**NOTE:** 37 C.F.R. § 1.28(b) requires “Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . the issue fee. . . .” From the wording of 37 C.F.R. § 1.28(b), (a) notification of change of status must be made even if the fee is paid as “other than a small entity” and (b) no notification is required if the change is to another small entity.

## 16. Instructions as to Overpayment

NOTE: "... Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

- ☒ Credit Account No. 08-1254  
☐ Refund

Reg. No. 32,991

Tel. No. (360) 647-1976

Customer No. 08-1254

  
SIGNATURE OF PRACTITIONER

Todd N. Hathaway

(type or print name of attorney)

119 N. Commercial St., #620

P.O. Address

Bellingham, WA 98225

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☐ **Incorporation by reference of added pages**

*(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)*

- ☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added \_\_\_\_\_

- ☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added \_\_\_\_\_

- ☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added \_\_\_\_\_

- ☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added \_\_\_\_\_

☐ **Statement Where No Further Pages Added**

*(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)*

- ☒ This transmittal ends with this page.

Practitioner's Docket No. P9169**PATENT**

☒ Applicant WALLACE H. PETERSON ☐ Patentee \_\_\_\_\_  
☐ Application No. \_\_\_\_\_ ☐ Patent No. \_\_\_\_\_  
☐ Filed on \_\_\_\_\_ ☐ Issued on \_\_\_\_\_  
 Title: SPACER FRAME BAR FOR INSULATED WINDOW

**VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS  
 (37 CFR 1.9(f) and 1.27(c))—SMALL BUSINESS CONCERN**

I hereby declare that I am

- ☒ the owner of the small business concern identified below:  
☐ an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Small Business Concern ALUMET MFG., INC.  
 Address of Small Business Concern 3803 - 136 Street N.E.  
Marysville, WA 98271

I hereby declare that the above identified small business concern qualifies as a small business concern, as defined in 13 CFR 121.12, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to, and remain with, the small business concern identified above, with regard to the invention described in

- ☒ the specification filed herewith, with title as listed above.  
☐ the application identified above.  
☐ the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c), if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

Each such person, concern or organization having any rights in the invention is listed below:

- ☐ No such person, concern, or organization exists.  
☐ Each such person, concern or organization is listed below.

Name \_\_\_\_\_

Address \_\_\_\_\_

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

Name \_\_\_\_\_

Address \_\_\_\_\_

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing WALLACE H. PETERSON

Title of Person if Other Than Owner President

Address of Person Signing 5312 - 23rd Avenue W.  
Everett, WA 98203

SIGNATURE \_\_\_\_\_

Date \_\_\_\_\_

(Small Entity-Small Business [7-4]—page 2 of 2)

Practitioner's Docket No. P9169**PATENT**

☒ Applicant WALLACE H. PETERSON ☐ Patentee \_\_\_\_\_  
☐ Application No. \_\_\_\_\_ ☐ Patent No. \_\_\_\_\_  
☐ Filed on \_\_\_\_\_ ☐ Issued on \_\_\_\_\_  
 Title: SPACER FRAME BAR FOR INSULATED WINDOW

**VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS**  
**(37 CFR 1.9(f) and 1.27(b))—INDEPENDENT INVENTOR**

As a below named inventor, I hereby declare that I qualify as an independent inventor, as defined in 37 CFR 1.9(c), for purposes of paying reduced fees to the United States Patent and Trademark Office under Sections 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office, with regard to the invention described in

- ☒ the specification filed herewith, with title as listed above.  
☐ the application identified above.  
☐ the patent identified above.

I have not assigned, granted, conveyed or licensed, and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c), if that person had made the invention, or to any concern that would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☐ No such person, concern, or organization exists.  
☐ Each such person, concern or organization is listed below. \*

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention availing to their status as small entities. (37 CFR 1.27)

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☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

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(Small Entity—Independent Inventor [7-1]—page 2 of 2)

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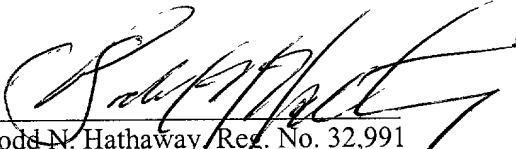
Commissioner of Patents and Trademarks  
U.S. Patent & Trademark Office  
Washington, D.C. 20231

Re: New U.S. Patent Application  
Inventor: WALLACE H. PETERSON  
Docket No. P9169  
SPACER FRAME BAR FOR INSULATED WINDOW  
Express Mail Label: EI551066248US  
Date of Deposit: 13 April 2000

Dear Sir:

The captioned application, a copy of which is attached, is being filed pursuant to the provisions of 37 CFR 1.53 (b), (d); the nature of the incompleteness being the unavailability of the inventor to execute the accompanying declaration. In accordance with the revisions of 37 CFR 1.10, we ask that this application be accorded an effective filing date of even date herewith notwithstanding the fact. We look forward to return receipt, in due course, of the Patent Office notification of incompleteness, at which time we will submit the completed declaration of the inventor.

Respectfully submitted,

  
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**PLEASE GIVE THIS APPLICATION A FILING DATE OF 13 APRIL 2000**



# SPACER FRAME BAR FOR INSULATED WINDOW

## BACKGROUND OF THE INVENTION

### a. Field of the Invention

The present invention relates generally to insulated windows, and, more particularly, to spacer frame tubing for spacing apart inner and outer panes of an insulated window, the tubing being constructed to accommodate inward and outward movement of the panes in response to changes in atmospheric pressure.

### b. Related Art

It is well known in the art to provide insulated windows having more than one pane of glass, the panes being separated by an air space. Typically, the panes are maintained in spaced apart relationship by a frame that is interposed between their edges. The interior space between the panes, which is typically filled with air or other gas, thus serves as an insulator to reduce heat flow through the window. In the prior art it is known to manufacture the frame from a plurality of individual tubes joined at their ends to form a continuous frame, or of a single tube which is bent to form the frame. The tubes are generally made of aluminum alloy, or of molded plastic or other material having sufficient rigidity to maintain the space between the panes; aluminum alloy has the advantages of strength, stability and longevity for this use.

The tubing typically has a somewhat rectangular form so as to provide inner and outer side walls for supporting the glass panes, and the hollow interior of the tubing often contains a supply of desiccant material which removes moisture from the interpane air space. Examples of spacer tubes of this general configuration include those shown in U.S. Patent Nos. 4,222,213 (Kessler), 4,576,841 (Limgemann), 5,439,716 (Larsen), and 5,581,971 (Peterson); many other examples of spacer frame tubing will occur to those skilled in the art.

Although very successful in most respects, it has been discovered that the configuration of conventional frame tubing may create a long term "weak spot" in many insulated window assemblies, especially those having relatively large,

continuous panes of glass, such as are commonly used in office buildings and similar structures.

To illustrate this problem, FIG. 1 shows an example of conventional spacer frame tubing 10 installed between first and second glass panes 12, 14 so as to define the interpane air space 16. As was described above, the spacer tubing has a generally rectangular cross-section with first and second side walls 20, 22 for supporting the panes and a hollow interior 24 which is filled with granular desiccant material 26. In the version which is shown in FIGS. 1-3, the side walls are formed with raised ribs for minimizing the contact area with the glass panes, so as to minimize thermal transfer through the aluminum alloy material of the spacer. A strip of sealant material 28 is installed outside the spacer tubing, i.e., between the tube and the edges of the panes, so as to form an air tight seal which excludes the surrounding atmosphere and moisture from the interpane space 16. The sealant strip is normally formed of a polymeric material which has a degree of resilience and surface adhesion when new, but which tends to lose these qualities with age.

FIG. 1 shows the assembly in its initial configuration, with panes 12, 14 extending parallel to one another and resting more or less flat against the side walls of the spacer tubing and the surfaces of the sealant strip. As soon as the window is installed, however, the panes begin to undergo virtually continuous relative movement due to changes in atmospheric pressure. As was noted above, the window is hermetically sealed by the strip 28, so that the pressure in the interpane space does not equalize with that of the surrounding air. As a result, an increase in pressure, as is shown in FIG. 2, causes the two panes to bow inwardly, in the directions indicated by arrows 30a, 30b (this movement being somewhat exaggerated in the figures for purposes of illustration), with the greatest amount of inward deflection taking place towards the middle of the unsupported window and away from the spacer tubing 10. As this happens, the inner surfaces 32, 34 of the glass panes react and pivot against the side walls 20, 22 of the spacer tubing, with the result that the edge portions 36, 38 of the panes which extend beyond the spacer tubing move apart in corresponding, outward directions, as indicated by

arrows 40a, 40b. This motion draws the inner surfaces 32, 34 of the panes outwardly, away from the surfaces 42, 44 of the sealant strip, with the result that the sealant eventually separates from the glass around the outer edges of the panes and thereby creates gaps and breaks in the seal, as indicated at arrows 46 and 48 in FIG. 2.

Conversely, a decrease in atmospheric pressure, as is illustrated in FIG. 3, causes the panes 12, 14 to bow outwardly towards their centers, as indicated by arrows 50a, 50b. As this happens, the sides 20, 22 of the spacer tubing again act somewhat in the manner of pivot points (due in part to the adhesion of the sealant material), and the edges 36, 38 of the panes press inwardly against the sealant strip 28 in the direction indicated by arrows 52a, 52b. This action tends to draw the inside surfaces of the panes away from the surfaces 42, 44 of the sealant along the sides of the spacer tubing, eventually causing the formation of additional gaps or openings, as indicated at 54, 56. Moreover, the sealant strip 28 resists being compressed between the edges of the glass panes, especially if the strip has hardened and lost its resilience, so much so that the edges of the panes can sometimes fracture and chip so as to leave little or no contact area between the pane and the sealant in the damaged area.

While the actual amounts of movement are comparatively small in absolute terms, they are significant (for example, the “bellows effect” generated by the flexing of the panes is sufficient to be employed to circulate the interpane air into and out of the desiccant material in some types of spacer tubing) and the resulting loads on the components can be quite great. In particular, with a very large window the distance from the unsupported centers of the panes to the spacer tubing around the perimeter of the window creates a very large lever arm as compared with the distance from the tubing to the outer edges of the panes, so that a small amount of movement at the centers of the panes results in comparatively large forces being exerted at the edges of the assembly.

The atmospheric pressure changes which generate these forces occur almost continuously, with pressures often fluctuating up and down several times in a single day, so that a window assembly may experience these forces/motions

5 over several thousand cycles during its lifetime. As a result, the repeated pulling  
away from the sealant and/or chipping of the panes eventually leads to one or  
more breaches being formed in the hermetic seal around the edge of the window  
assembly. This allows moisture to enter the interpane space, so that the window  
quickly becomes fogged and must be replaced.

10 Many modern structures, such as large office towers are fitted with a huge  
number of insulated window assemblies. The cost of having to replace even a  
few of these window assemblies can be extraordinarily high, and so any  
improvement which extends the service life of the assemblies can easily translate  
to large economic savings.

15 Accordingly, there exists a need for a spacer tubing having a construction  
which reduces or eliminates the tendency of the outer edges of the glass panes in  
an insulated window assembly to pull away from and press against the sealant  
strip at the edge of the assembly as the panes flex inwardly and outwardly in  
response to changes in atmospheric pressure. Furthermore, there exists a need for  
20 such a spacer tubing which has a hollow interior for containing a supply of  
desiccant material therein, and which permits a degree of fluid communication  
between the interior of the tubing and the interpane space so as to allow the  
desiccant material to withdraw moisture therefrom. Still further, there exists a  
need for such a spacer tubing which is economical to manufacture, and which is  
25 sufficiently strong and durable to enjoy a long service life. Still further, there  
exists a need for such a spacer tubing which is compatible with existing window  
assembly techniques, and which does not require special equipment or techniques  
in order to fabricate a spacer frame therefrom.

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## SUMMARY OF THE INVENTION

The present invention has solved the problems cited above. Broadly, this is a spacer frame tubing for being mounted between first and second glass panes in an insulated window assembly, the tubing comprising first and second side wall portions for engaging inner surfaces of the glass panes and a transverse wall portion interconnecting the side wall portions so as to support the side wall portions in spaced-apart relationship, the transverse wall portion being configured to permit the side wall portions to move alternately towards and away from one another in response to inward and outward forces inserted by the glass panes so as to minimize development of a pivoting action between the inside surfaces of the panes and the side wall portions of the tubing.

In a preferred embodiment, the transverse wall portion of the tubing may comprise at least first and second web portions which extend from the side wall portions and are joined by a seam structure, the seam structure being configured to permit the web portions to move alternately towards and away from one another in response to the inward and outward forces which are exerted by the glass panes in the window assembly. The seam structure may comprise a plurality of tab portions formed on edges of the first and second web portions, the tab portions on the first web portion forming a sliding interfit with the tab portions on the second web portion so as to permit the web portions to move alternately towards and away from one another without separating.

The tab portions on the edge of the first web portion may alternately overlap and underlap the tab portions on the edge of the second web portion in a sliding engagement therewith. The overlapping and underlapping tab portions may form generally planar engagement surfaces which extend generally parallel to the web portions, and the first and second web portions may extend in generally co-planar relationship to form a flat inner surface on the tubing.

The tab portions on each edge of the web portions may comprise alternating upper and lower tab portions, the upper tab portions extending in

generally co-planar relationship with the web portions and the lower tab portions bending downwardly from base portions which are joined to the web portion. Each of the tab portions may comprise a substantially rectangular outer end, and the base portions of the lower tab portions may be positioned at spaced distances from the juxtapositioned outer ends of the upper tab portions so as to form gaps for permitting the ends of the upper tab portions to move towards the bases of the lower tab portions as the web portions move towards one another. The rectangular outer ends of the upper and lower tab portions may also comprise first and second edge faces for engaging the edge faces on adjoining tab portions in sliding interfit therewith.

The spacer frame tubing may further comprise a second transverse wall portion, so that the sidewall portions and transverse wall portions define a hollow interior of the tubing. The tubing may have generally rectangular cross section, and there may be at least one projecting rib formed on each side wall portion for limiting engagement with the inner surfaces of the glass panes to line-contact therewith; the projecting ribs may be formed proximate the transverse wall portion having the seam structure formed therein. A particulate desiccant material may be disposed within the hollow interior of the tubing.

The present invention also provides an insulated window assembly, comprising first and second glass panes having inner surfaces and spacer frame tubing mounted between the first and second glass panes, the tubing comprising first and second side wall portions for engaging inner surfaces of the glass panes and a transverse wall portion interconnecting the side wall portions so as to support the side wall portions in spaced apart relationship, the transverse wall portion being configured to permit the side wall portions to move alternately towards and away from one another in response to inward and outward forces exerted by the glass panes so as to minimize development of a pivoting action between the inner surfaces of the panes and the side wall portions of the tubing.

The spacer frame tubing may be mounted between outer edges of the glass panes proximate a perimeter of the window assembly, with said inward forces exerted against the sidewall portions of the tubing being caused by an inward

5 bowing of the glass panes in response to an increase in atmospheric pressure, and  
the outward forces exerted against the sidewall portions of the tubing being  
caused by an outward bowing of the glass panes in response to a decrease in  
atmospheric pressure. The assembly may further comprise a sealant strip which  
10 is mounted between the outer edges of the glass panes outside of the spacer frame  
tubing.

These and other features and advantages of the present invention will be  
apparent from the reading of the following detailed description with reference to  
the associated figures.

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## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an enlarged, cross-sectional view of spacer tubing in accordance with the prior art, showing this mounted between first and second glass panes at the edge of an insulated window assembly;

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FIG. 2 is a cross-sectional view, similar to FIG. 1, showing the manner in which inward flexing of the glass panes due to an increase in atmospheric pressure causes the outer edges thereof to react against the spacer tubing so as to pull away from the sealant strip at the edge of the assembly;

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FIG. 3 is a cross-sectional view, similar to FIGS. 1-2, showing the manner in which outward bowing of the glass panes due to a decrease in atmospheric pressure causes the outer edges thereof to react against the spacer tubing so as to press inwardly against the sealant strip;

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FIG. 4 is an enlarged, cross-sectional view, similar to FIG. 1, showing spacer tubing in accordance with the present invention mounted between parallel glass panes at the edge of an insulated window assembly;

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FIG. 5 is a cross-sectional view, similar to FIG. 2, showing the manner in which the compressible seam in the upper wall of the tubing of the present invention enables this to accommodate inward flexing of the glass panes so as to minimize the tendency of the edges thereof to pull away from the sealant strip at the perimeter of the assembly;

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FIG. 6 is a cross-sectional view, similar to FIG. 3, showing the manner in which the compressible seam in the upper wall of the spacer tubing of the present invention enables this to accommodate outward bowing of the glass panes so as to minimize the tendency of the edges thereof to press inwardly against the sealant strip;

FIG. 7 is an enlarged, perspective view of the upper wall of the spacer tubing of the present invention as shown in FIGS. 4-6, showing the overlapping and interleaved edge segments which form the compressible seam structure therein;



5           FIG. 8 is an end, cross-sectional view of a section of spacer tubing in accordance with the present invention, showing this in an initial step in the formation thereof, in which the edge tabs on either side of the seam have been displaced alternately upwardly and downwardly in preparation for interleaving with the tabs on the opposite side of the seam;

10           FIG. 9 is an end, cross-sectional view, similar to FIG. 8, showing the section of spacer tubing in a subsequent step in the formation thereof, in which the sidewalls of the tubing are forced together so as to move the tabs on the edge of the seam into interleaved engagement with one another;

15           FIG. 10 is a cross-sectional view, similar to FIGS. 8-9, showing the tubing section in a third stage in the formation thereof, in which the interleaved edge segments are pressed between a roller and die so as to form a stable yet compressible seam structure, with a recess of predetermined depth being formed in the upper surface of the die to accommodate the downwardly bent tab portions of the seam structure;

20           FIG. 11 is an enlarged, cross-sectional view of the seam formed by the steps shown in FIGS. 8-10, showing the vertical clearance which is maintained between the overlapping tab portions so as to permit sliding movement to develop between the tab portion in response to inward and outward pressures exerted against the side walls of the tubing.

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## DETAILED DESCRIPTION

## a. Overview

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The present invention provides a form of construction for window spacer frame tubing, in which a transverse wall of the tubing is provided with a seam structure which undergoes lateral compression and expansion in response to inwardly and outwardly directed pressure exerted by the edges of the glass panes. This lateral movement allows the effective width of the transverse wall to decrease and increase in response to the pressures, thereby reducing or eliminating the tendency of the glass panes to develop a pivoting action against the sidewalls of the tubing. As a result, forces which would otherwise cause the panes to pull away from the spacer tubing and the sealant strip around the perimeter of the window assembly are greatly reduced or eliminated. This in turn helps to maintain the integrity of the hermetic seal at the edge of the window assembly and greatly extends the service life of the assembly.

As used in this description and the appended claims, the term "tubing" is meant to include all tubes, bars and similar structures which serve the purpose of maintaining a spaced distance between the panes in an insulated window assembly, whether or not these have a hollow core or interior as in the preferred embodiment shown herein. Moreover, it will be understood that, while the advantages of the present invention are believed to be best achieved with the compressible seam disposed towards the interpane air space, there may be other embodiments in which the seam faces in the opposite direction, i.e., towards the outer edge of the assembly. Still further, it will be understood that, while in most embodiments a seam strip will be installed between the edges of the glass panes outside of the spacer tubing as is shown herein, there may be some embodiments in which there is no sealant strip, or the sealing means may be formed as an integral part of the spacer tubing itself.

b. Structure

FIG. 4 shows a section of spacer frame tubing 110 in accordance with the present invention, mounted at the edge of a window assembly 112 between first and second glass panes 114, 116. As with the window assembly which is shown in FIGS. 1-3, the glass panes define an interpane air space 117 which reduces thermal transfer through the assembly. Also similar to the conventional assembly described above, the outer edge portions 118, 120 of the panes extend beyond the spacer frame tubing 110, with the area between the protruding edges of the panes being filled by a sealant strip 122. The sealant strip may be formed of any suitable sealant material, such as that which has been described above, and may be applied in a solid, liquid or semi-liquid form.

Spacer tubing 110 has a generally rectangular cross-section, with first and second side walls 124, 126 that engage and support the inner surfaces 128, 130 of the glass panes, and upper and lower transverse walls 132, 134 that in turn support the sidewalls 124, 126 in spaced-apart relationship. The hollow interior 136 of the tubing is filled with a particulate desiccant material 138, in a manner similar to that described above.

As can be seen with further reference to FIG. 4, the side walls 124, 126 are suitably provided with raised, longitudinal ribs 140, 142 so as to minimize the contact area with the surfaces of the glass panes, and thereby reduce transmission of thermal energy through the tubing. In the preferred embodiment which is illustrated, the spacer tubing is constructed of roll-formed aluminum alloy, although it will be understood that any other suitable, substantially rigid metallic or non-metallic material may be used for this purpose.

The outer wall 134 of the tubing (i.e., that wall which faces outwardly towards the edge of the window assembly and away from the interpane space) is preferably somewhat narrower than the inner wall, and is formed as a single, continuous web in the embodiment which is illustrated. The inner wall 132 (i.e., that wall which faces inwardly towards the interpane space), however, is formed

of two longitudinally-extending web portions 142, 144 which are joined by a central seam structure 150. As will be described in greater detail below, the seam structure is configured so that the edge segments of the two web portions overlap one another by predetermined distance "d", and are free to slide laterally with respect to one another in response to inwardly and outwardly directed pressures which are exerted against the side walls of the tubing.

Thus, as can be seen in FIG. 5, an increase in atmospheric pressure results in the glass panes 114, 116 bowing inwardly, in much the same manner as described above, in the directions indicated by arrows 152, 154. As this happens, the inwardly directed forces which are applied to the side walls of the tubing cause the two web portions 142, 144 to move towards one another, in the directions indicated by arrows 156, 158. This movement is accommodated by the sliding interfit of the edge tabs which form the seam structure 150, and which increase their overlap as indicated at "d'". This resilient inward movement causes a decrease in the width of the inner wall 132, simultaneous with the inward movement of the inner surfaces 128, 130 of the glass panes, thereby minimizing or eliminating the effect of the tubing acting as a pivot point against the panes. As a result, the tendency to develop an outward, spreading movement between the outer edges 118, 120 of the panes is also greatly reduced or eliminated, as indicated by arrows 160, 162 in FIG. 5.

Similarly, as is shown in FIG. 6, a decrease in atmospheric pressure causes the central portions of the panes 114, 116 to bow outwardly, as indicated by arrows 164, 162. As this happens, the outwardly directed forces which are applied to the side walls 124, 126 of the tubing (which are bonded to the inner surfaces of the panes by sealant 122) cause the two web portions 142, 144 to be drawn apart, in the directions indicated by arrows 170, 172. This decreases the sliding overlap between the two sets of edge segments, as indicated at "d'", and increases the effective width of the inner wall 132 of the tubing, but without causing the sides of the seam to separate (which would allow the desiccant material to escape into the interpane space). Again, this minimizes or eliminates the effect of the tubing providing a pivot point against the inside surfaces of the

panes, so that the tendency to develop an inward motion at their outer edges 118, 122 is greatly reduced or eliminated, as is indicated at arrows 174, 176 in FIG. 6.

The ability of the seam 150 to spread and compress in response to inwardly and outwardly directed forces thus greatly reduces the inward and outward motions of the edges of the panes relative to the sealant strip 122. Consequently, the tendency for the edges of the pane to pull away and separate from the sealant strip, or to press against the strip and fracture, is greatly reduced or eliminated. Furthermore, the spreading movement of the seam greatly reducing any tendency for the panes to separate from the inner edges of the spacer tubing.

#### c. Manufacture

As was noted above, the spacer tubing of the present invention is suitably formed of roll-formed aluminum alloy. FIGS. 7-11 show a preferred manner of forming the tubing using this material.

As can be seen in FIG. 7, the overlapping edges of the two web portions 142, 144 which make up the sliding seam structure 150 comprise a series of interleaved tab portions, with a first series of alternating upper and lower tab portions 180a, 180b being formed along the first web portion 142, and a corresponding series of upper and lower tab portions 182a, 182b being formed along the opposite web portion 144.

Each tab portion overlaps (either above or below) a corresponding tab portion on the opposite edge of the seam. As can be seen, each of the upper tab portions 180a, 182a extends in a generally coplanar direction from the web portion on which it is formed, while the lower tab portions 180b, 182b bend downwardly beneath the upper tab portions so as to establish a sliding engagement against the lower surfaces thereof. The side edges 184a, 184b, and 186a, 186b where adjacent tab portions meet also form a sliding interfit which enables the tab portions to move inwardly and outwardly with respect to one

another; corresponding side edges, (not visible in FIG. 7) are similarly formed on the lower tab portions 180b, 182b.

The outer ends of the tab portions have a generally rectangular configuration and are sized so that spaces or gaps 188 are formed between the tips of the upper tab portions and the juxtapositioned bases 192 of the opposite, underlying tab portions, thereby providing room for the ends of the tab portions to move inwardly as the seam is compressed.

The interfitting tab portions thus form a strong, stable seam structure without the need for welding or any other form of fixed connection. A further advantage of the sliding fit between the tab portions is that this allows air to pass through seam structure and into and out of the hollow interior 136 of the tubing, so that the desiccant material can withdraw moisture from the interpane space without requiring separate perforations or openings in the wall of the tubing.

FIGS. 8-10 show sequential steps in a preferred method for forming the seam structure which is shown in FIG. 7. As can be seen, the rows of upper and lower tab portions 180a, 180b and 182, 182b are initially cut and bent upwardly and downwardly along the edges of the two flange portions 142, 144, using cutter wheels or other suitable means. The side walls and the web portions are then bent towards one another so as to shape the tubing into its desired, generally rectangular configuration, and the tubing is then passed through horizontally opposed rollers 194, 196 which bear against the side walls 124, 126 of the tubing so as to force the tab portions into an initial, interfitting engagement as shown in FIG. 9.

In the next roll-forming stage, the tubing is passed between a set of vertically opposed rollers 200, 202. A stationary die 204 is interposed between the rollers, in engagement with the inside surfaces of the upper and lower walls of the tubing, so as to transfer the compressive loads therethrough (the die is mounted on a rod which extends between the rollers "upstream" of those which are shown in FIGS. 9-10).

As can be seen in FIG. 10, the upper surface 206 of the die is formed with a recessed channel 208 in the area below the seam structure 150. The depth of the

channel is selected to correspond approximately of that of the overlapped upper and lower tab portions (i.e., approximately double the thickness of the aluminum alloy sheet material which the tubing is formed). Thus, as the tubing passes between the upper and lower rollers, the upper roller bends and presses the upper tab portions 180a, 182b downwardly into a flat, generally horizontal orientation, while the channel 208 in the die bends the lower tab portions 180b, 182b upwardly into a generally horizontal orientation against the bottom surfaces of the upper tab portions. The depth of the channel 208 is selected to be sufficiently shallow to force the surfaces of the upper and lower tab portions into the desired, face-to-face, sliding engagement, but is deep enough to prevent the metal from becoming fused where the upper and lower tab portions meet; as was noted above, the depth of the groove may suitably be about twice that of the thickness of the alloy sheet material.

Thus, when the tubing passes out of the rollers in its finished form, the resilience of the aluminum alloy material causes the upper and lower tab portions to spring apart slightly, so as to create a small gap 210 which provides a degree of clearance between the parallel bearing surfaces 212, 214 on the overlapped tab portions. The clearance is relatively small (e.g., 0.001-0.003"), however it is sufficient to permit the tabs to slide laterally with respect to one another with a minimum of resistance, while still maintaining the desired degree of strength and structural integrity in seam 150. It should be noted that this construction is distinct from other forms of overlapping structures where no clearance is provided for allowing movement between the two components.

The finished product having the preferred configuration shown in the drawings thus has a smooth, aesthetically pleasing external appearance, and is free from rough or sharp edges along the exposed side of the seam structure 150. It will be understood, however, that in some embodiments the seam may be formed with tab portions having different orientations and/or shapes from those which have been shown herein.

#### d. Example Dimensions

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The dimensions of the spacer tubing in accordance with the present invention will vary depending on the size of the window assembly, the material from which the tubing is formed, and other design factors. In one exemplary embodiment, satisfactory dimensions have been found to be as follows:

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Material	Roll-formed aluminum alloy sheet
Material thickness	1/64"
Inner wall width	1/2"
Overall seam width	1/16"
Tab end portion length	3/64"
Tab portion end gap	1/64"
Outer wall width	3/8"

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When using 1/64" roll-formed aluminum alloy material, the width of the tab portions is preferably within the range from 3/32" to about 1/32" for those embodiments in which the tubing is intended to be bent to form the corners of the frame assembly, with the latter width being most preferred; widths above this range tend to result in the seam separating upon bending, while tabs having narrower widths tend to lack sufficient strength and structural integrity. However, for those embodiments where the tubing is not intended to be bent to form the corners of the spacer frames (e.g., the corners are formed by molded plastic connectors or the like), the range of acceptable widths for the tab portions may be much greater; for example, tab portions having a width of 3/8" or greater may be suitable for use in many such embodiments. Again, the actual dimensions in a particular embodiment may vary from those given above, depending on materials and applicable design factors.

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It is to be recognized that various alterations, modifications, and/or additions may be introduced into the constructions and arrangements of parts described above without departing from the spirit or ambit of the present invention as defined by the appended claims.



5 What is claimed is:

1. Spacer frame tubing for being mounted between first and second glass panes in an insulated window assembly, said tubing comprising:

10 first and second sidewall portions for engaging inner surfaces of said glass panes; and

15 a transverse wall portion interconnecting said sidewall portions so as to support said sidewall portions in spaced-apart relationship, said transverse wall portion being configured to permit said sidewall portions to move alternately towards and away from one another in response to inwardly and outwardly directed forces exerted by said glass panes so as to minimize development of a pivoting action between said inner surfaces of said panes and said sidewall portions of said spacer frame tubing.

20 2. The spacer frame tubing of claim 1, wherein said transverse wall portion of said tubing comprises:

25 at least first and second web portions which extend from said sidewall portions and which are joined by a seam structure, said seam structure being configured to permit said web portions to move alternately towards and away from one another in response to said inwardly and outwardly directed forces exerted by said glass panes in said assembly.

3. The spacer frame tubing of claim 2, wherein said seam structure comprises:

30 a plurality of tab portions formed on edges of said first and second web portions, said tab portions on said first web portion forming a sliding interfit with said tab portions on said second web portion so as to permit said web portions to move alternately towards and away from one another.

35 4. The spacer frame tubing of claim 3, wherein said tab portions on said edge of said first web portion alternately overlap and underlap said tab portions on said edge of said second web portion in sliding interfit therewith.

5

5. The spacer frame tubing of claim 4, wherein said overlapping and underlapping tab portions meet along planar engagement surfaces which extend generally parallel to said first and second web portions.

10

6. The spacer frame tubing of claim 5, wherein said first and second web portions extend in generally co-planar relationship.

15

7. The spacer frame tubing of claim 6, wherein said tab portions on each said edge of said web portions comprise alternating upper and lower tab portions, said upper tab portions extending in generally co-planar relationship with said web portion and said lower tab portions bending downwardly from base portions at which said lower tab portions are joined to said web portions.

20

8. The spacer frame tubing of claim 7, wherein each of said tab portions comprises a substantially rectangular outer end.

25

9. The spacer frame tubing of claim 8, wherein said base portions of said lower tab portions are positioned a spaced distance from said juxtapositioned outer ends of said upper top portions so as to form a gap for permitting said ends of said upper tab portions to move towards said bases of said lower tab portions as said first and second web portions move towards one another.

30

10. The spacer frame tubing of claim 8, wherein said rectangular outer ends of said upper and lower tab portions each comprise:

first and second edge faces for engaging corresponding edge faces on outer ends of adjoining tab portions in sliding interfit therewith.

35

11. The spacer frame tubing of claim 2, further comprising:

a second transverse wall portion, so that said sidewall portions and said transverse wall portions cooperate to define a hollow interior of said tubing.

5

12. The spacer frame tubing of claim 11, further comprising:  
a particulate desiccant material disposed within said hollow interior of said tubing.

10

13. The spacer frame tubing of claim 11, wherein said tubing has a generally rectangular cross-section.

15

14. The spacer frame tubing of claim 13, further comprising:  
at least one projecting rib formed on each said sidewall portion of said tubing for limiting engagement with said inner surfaces of said glass panes to line-contact engagement therewith.

20

15. The spacer frame tubing of claim 14, wherein said projecting ribs on said sidewall portions are formed proximate said transverse wall portion having said seam structure formed therein.

25

16. The spacer frame tubing of claim 2, wherein said tubing is constructed of roll-formed sheet aluminum alloy material.

17. The spacer frame tubing of claim 6, wherein said tubing is constructed of roll-formed sheet aluminum alloy material.

30

18. An insulated window assembly, comprising:  
first and second glass panes having inner surfaces; and  
spacer frame tubing mounted between said first and second glass panes, said tubing comprising:

35

first and second sidewall portions for engaging inner surfaces of said glass panes; and  
a transverse wall portion interconnecting said sidewall portions so as to support said sidewall portions in spaced-apart relationship, said

transverse wall portion being configured to permit said sidewall portions to move alternately towards and away from one another in response to inwardly and outwardly directed forces exerted by said glass panes so as to minimize development of a pivoting action between said inner surfaces of said panes and said sidewall portions of said spacer frame tubing.

19. The insulated window assembly of claim 18, wherein said transverse wall portion of said spacer frame tubing comprises:

at least first and second web portions which extend from said sidewall portions and which are joined by a seam structure, said seam structure being configured to permit said web portions to move alternately towards and away from one another in response to said inwardly and outwardly directed forces exerted by said glass panes in said assembly.

20. The insulated window assembly of claim 19, wherein said seam structure comprises:

a plurality of tab portions formed on edges of said first and second web portions, said tab portions on said first web portion forming a sliding interfit with said tab portions on said second web portion so as to permit said web portions to move alternately towards and away from one another.

21. The insulated window of claim 20, wherein said tab portions on said edge of said first web portion alternately overlap and underlap said tab portions on said edge of said second web portion in sliding interfit therewith.

22. The insulated window assembly of claim 21, wherein said overlapping and underlapping tab portions meet along planar engagement surfaces which extend generally parallel to said first and second web portions.

23. The insulated window assembly of claim 22, wherein said first and second web portions extend in generally co-planar relationship.

5

24. The insulated window assembly of claim 23, wherein said tab portions on each said edge of said web portions comprise alternating upper and lower tab portions, said upper tab portions extending in generally co-planar relationship with said web portion and said lower tab portions bending downwardly from base portions at which said lower tab portions are joined to said web portions.

25. The insulated window assembly of claim 24, wherein each of said tab portions comprises a substantially rectangular outer end.

26. The insulated window assembly of claim 25, wherein said base portions of said lower tab portions are positioned a spaced distance from juxtapositioned outer ends of said upper tab portions so as to form a gap for permitting said ends of said upper tab portions to move towards said bases of said lower tab portions as said first and second web portions move towards one another.

27. The insulated window assembly of claim 26, wherein said rectangular outer ends of said upper and lower tab portions each comprise:

first and second edge faces for engaging corresponding edge faces on outer ends of adjoining tab portions in sliding interfit therewith.

28. The insulated window assembly of claim 19, wherein said tubing has a generally rectangular cross-section.

29. The insulated window assembly of claim 28, further comprising:

at least one projecting rib formed on each said sidewall portion of said tubing for limiting engagement with said inner surfaces of said glass panes to line-contact engagement therewith.

5           30.     The insulated window assembly of claim 29, wherein said projecting ribs on said sidewall portions are formed proximate said transverse wall portion having said seam structure formed therein.

10           31.     The insulated window assembly of claim 18, wherein said tubing is constructed of roll-formed sheet aluminum alloy material.

15           32.     The insulated window assembly of claim 18, wherein said spacer frame tubing is mounted between outer edges of said glass panes proximate a perimeter of said assembly, said inward forces exerted against said sidewall portions of said tubing are being caused by inward bowing of said glass panes in response to an increase in atmospheric pressure, and said outward forces exerted against said sidewall portions of said tubing being caused by outward bowing of said glass panes in response to a decrease in atmospheric pressure.

20           33.     The insulated window assembly of claim 32, further comprising:  
              a sealing strip mounted between said outer edges of said glass panes outside of said spacer frame tubing.

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## ABSTRACT

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Spacer frame tubing for being mounted between first and second panes in an insulated window assembly, the tubing being configured to flex inwardly and outwardly in response to inwardly and outwardly directed pressures exerted by the glass panes so as to minimize the tendency of the panes to pivot against the sidewalls of the tubing. The reduction in pivoting action reduces the tendency of the edges of the panes to alternately pull away from and press against the sealing strip around the perimeter of the window assembly as the panes bow in response to changes in atmospheric pressure, thereby reducing the tendency of the edges of the panes to separate from or fracture against the sealing strip. The tubing has first and second side walls for engaging the inside surfaces of the glass panes, and a transverse wall interconnecting the sidewall portions. The transverse wall portion is made up of first and second web portions that are joined by a seam structure, the seam structure being formed by a series of overlapping and underlapping tab portions which engage one another in sliding interfit. The sliding interfit permits the web portions to slide towards and away from one another while still keeping the seam structure intact. The tubing may be constructed of roll-formed aluminum alloy sheet material, and a particulate desiccant material may be enclosed within the hollow interior of the tubing.

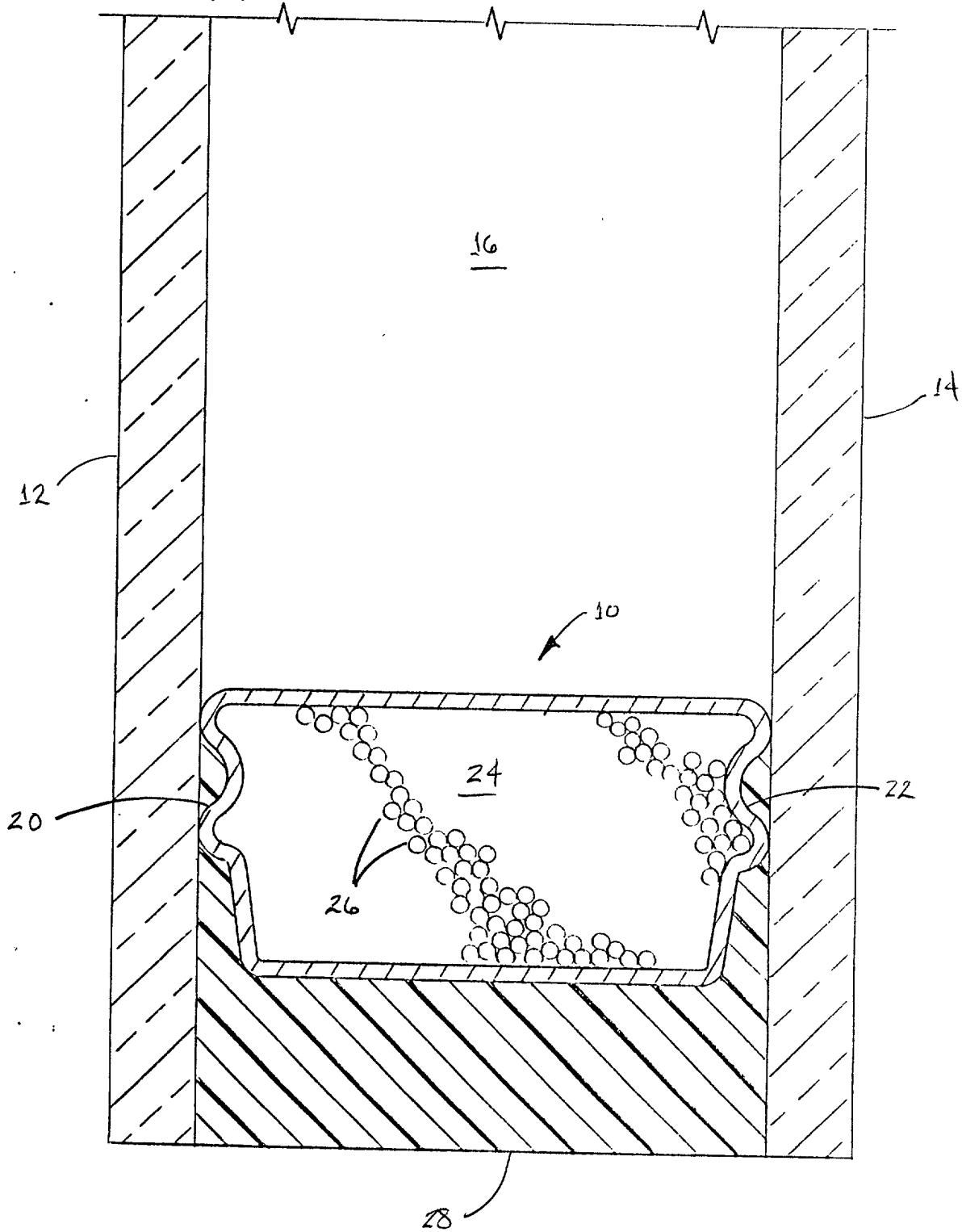
FIG. 1  
PRIOR ART



FIG. 2  
PRIOR ART

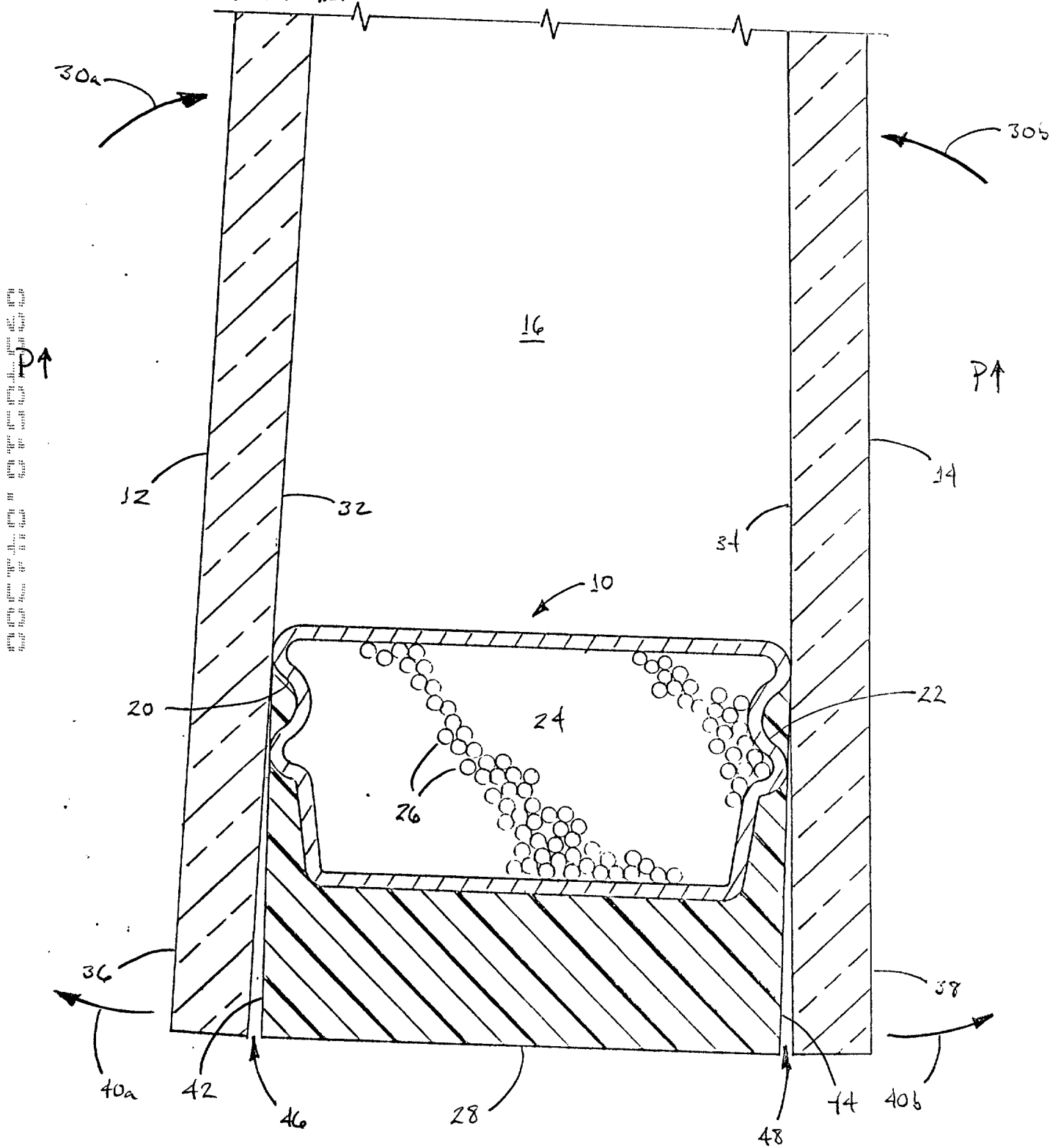
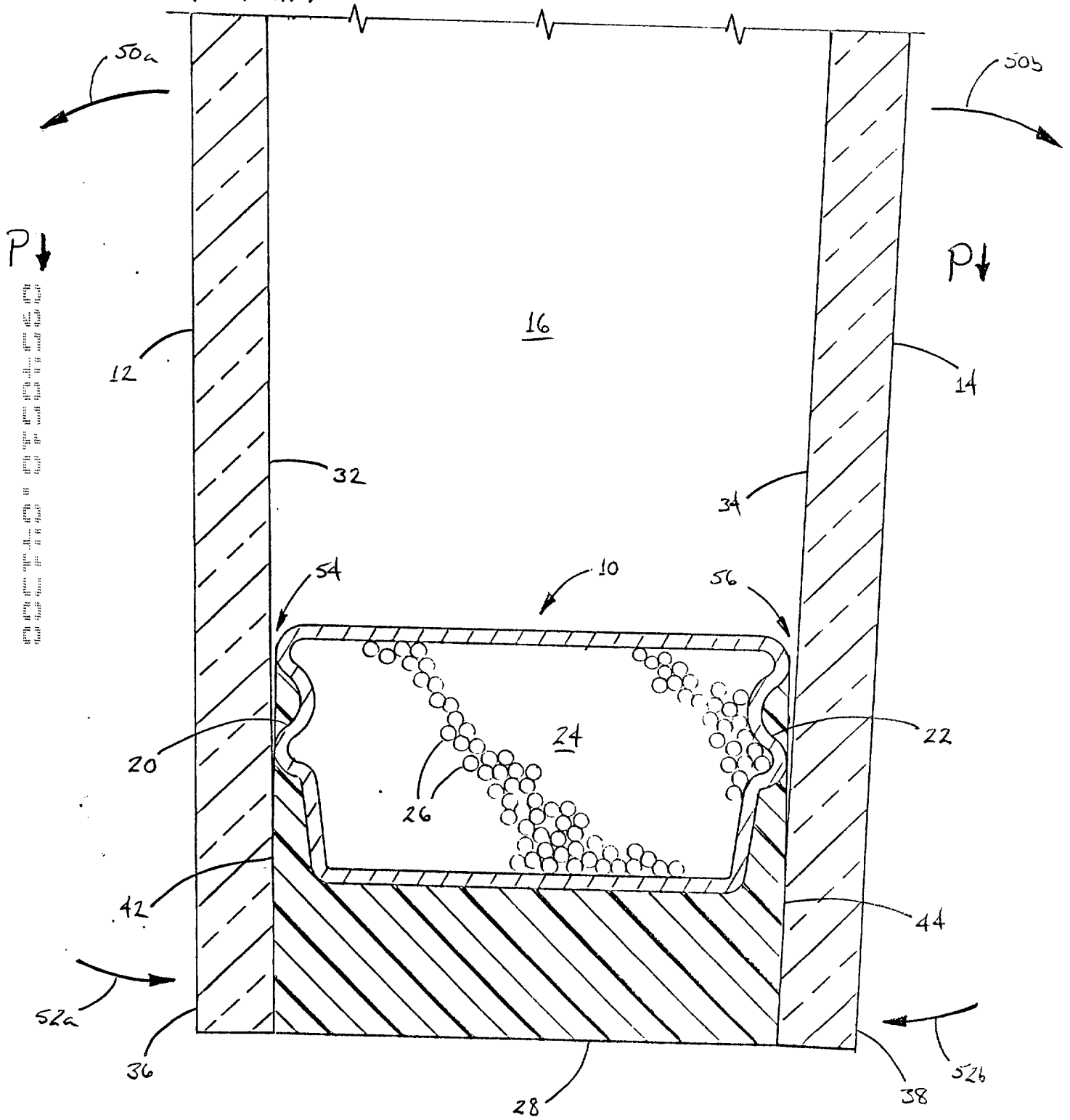
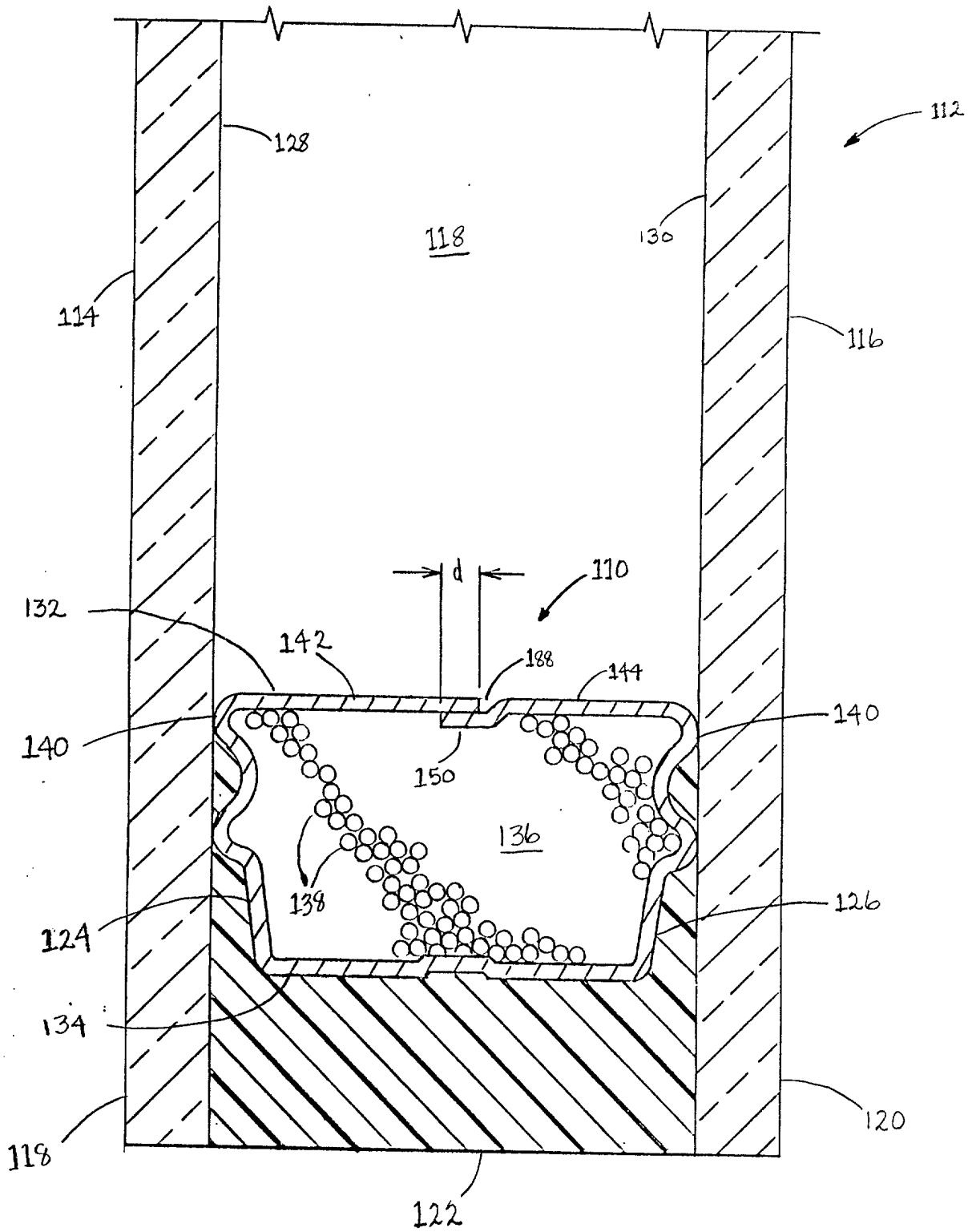


FIG. 3  
PRIOR ART



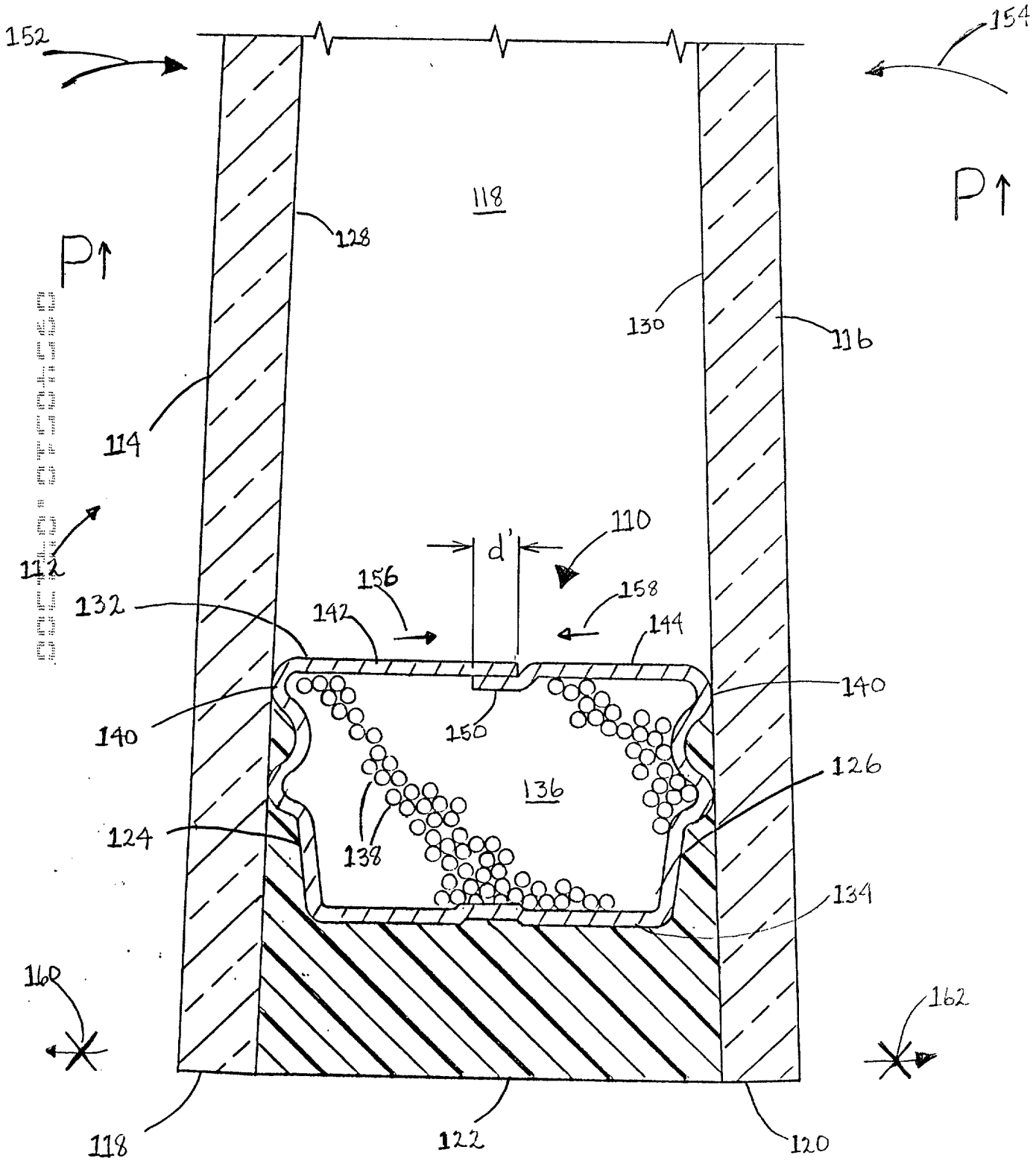
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FIG. 4



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FIG. 5



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FIG 6

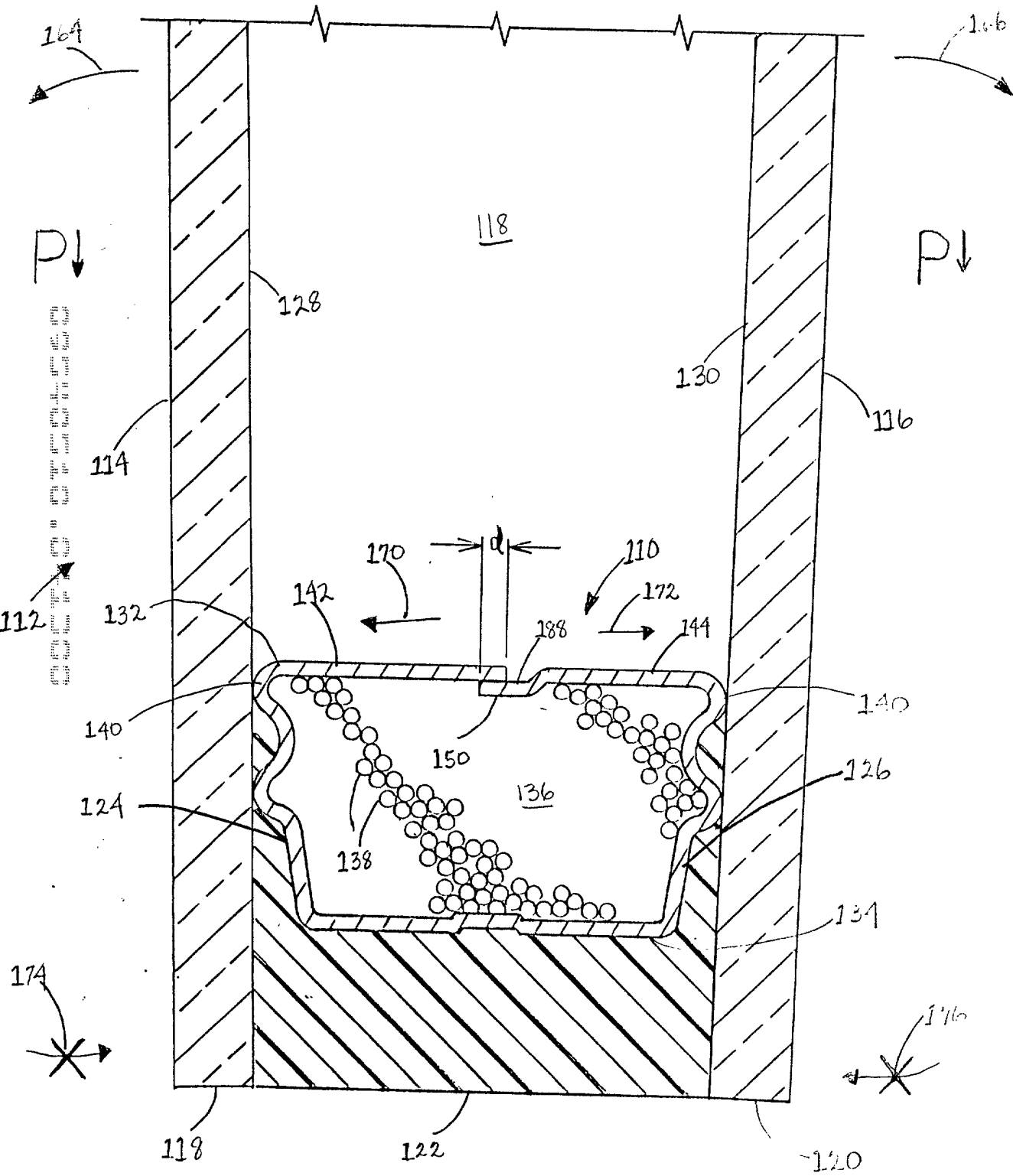


FIG. 7

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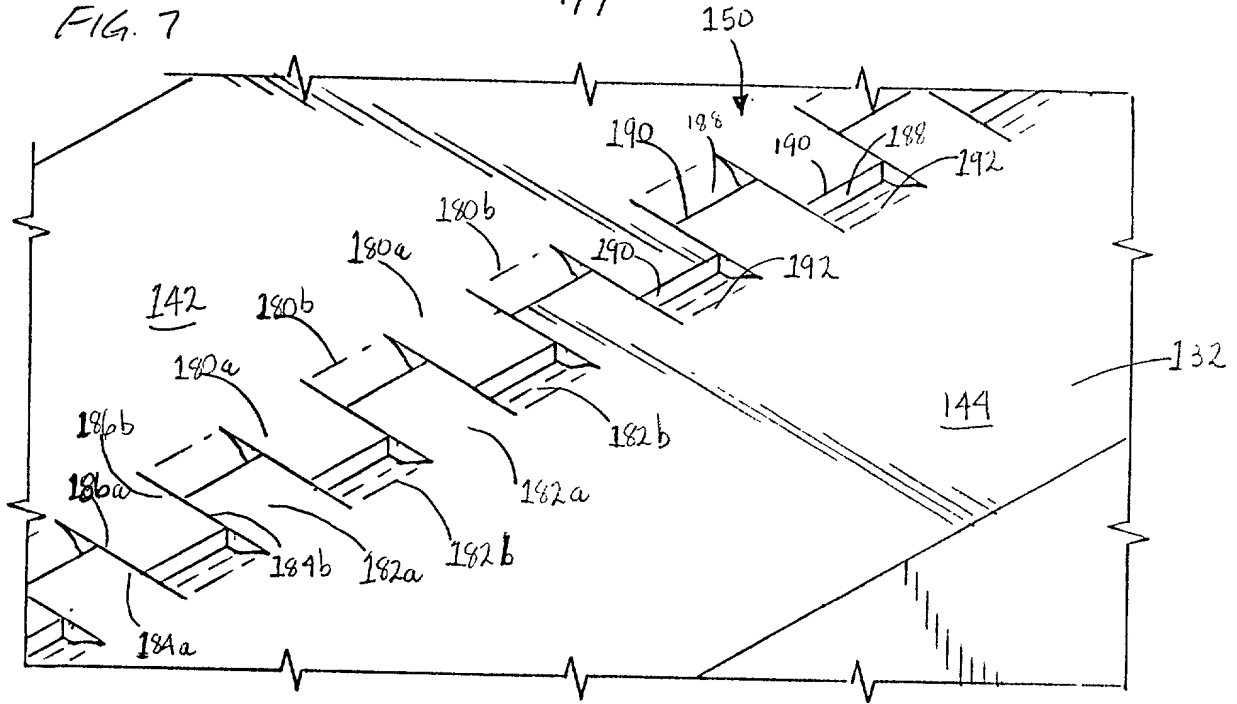
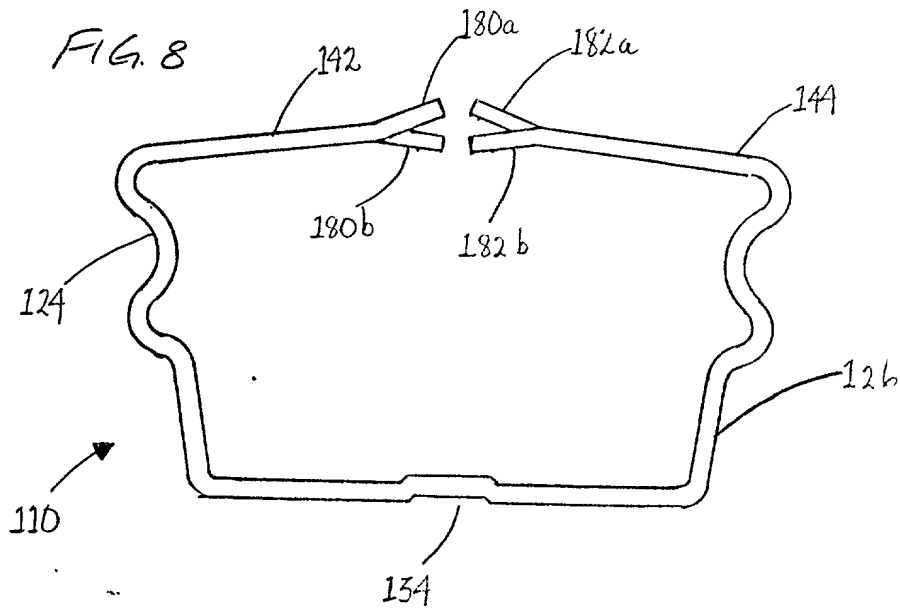
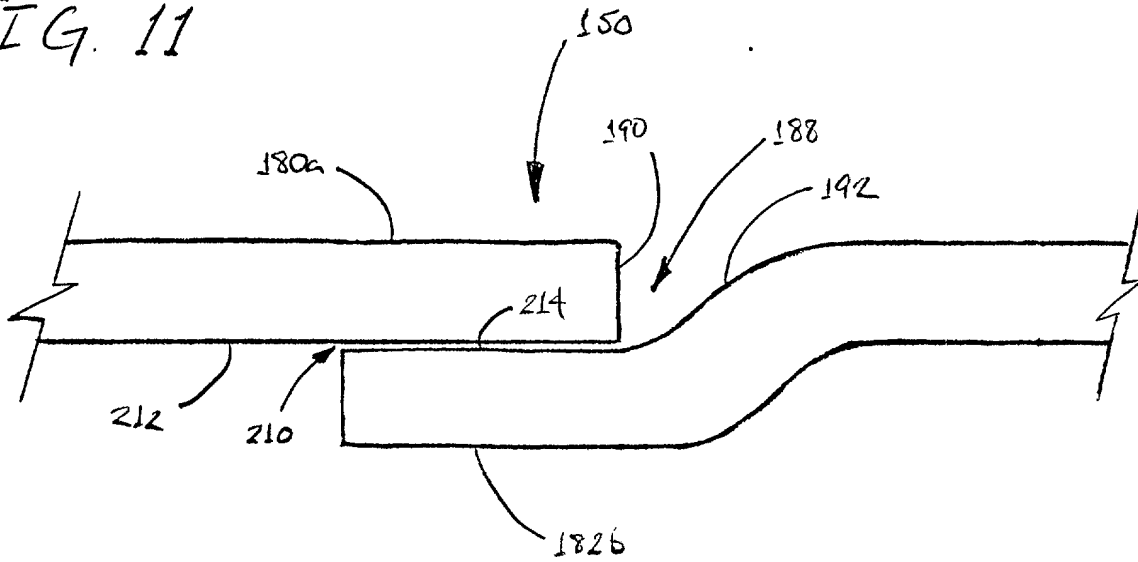


FIG. 8



A cross-sectional view of a device 110. The device consists of a central cavity 209 with a wavy outer boundary 208. This cavity is flanked by two horizontal layers, 206 on top and 202 on the bottom. The entire assembly is connected to a power source 200 at the top and bottom, indicated by a zigzag line. The central cavity 209 is filled with a material represented by diagonal hatching.

FIG. 11





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**COMBINED DECLARATION AND POWER OF ATTORNEY**

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL,  
CONTINUATION, OR C-I-P)

---

As a below named inventor, I hereby declare that:

**TYPE OF DECLARATION**

This declaration is of the following type:

(check one applicable item below)

- ☒ original.  
☐ design.  
☐ supplemental.

NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.

- ☐ national stage of PCT.

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

NOTE: See 37 C.F.R. § 1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.

- ☐ divisional.  
☐ continuation.

NOTE: Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. § 1.53(b) (application filing requirements — nonprovisional application).

- ☐ continuation-in-part (C-I-P).

**INVENTORSHIP IDENTIFICATION**

**WARNING:** If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

**TITLE OF INVENTION**

SPACER FRAME BAR FOR INSULTAED WINDOW

---

## SPECIFICATION IDENTIFICATION

the specification of which:

(complete (a), (b), or (c))

(a) ☒ is attached hereto.

NOTE: "The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) ☐ was filed on \_\_\_\_\_, as ☐ Serial No. 0 / \_\_\_\_\_  
or ☐ \_\_\_\_\_  
and was amended on \_\_\_\_\_ (if applicable).

NOTE: Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 CFR 1.67.

NOTE: "The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 CFR 1.63:

"(1) name of inventor(s), and application number (consisting of the series code and the serial number; e.g., 08/123,456);

"(2) name of inventor(s), serial number and filing date;

"(3) name of inventor(s) and attorney docket number which was on the specification as filed;

"(4) name of inventor(s), title which was on the specification as filed and filing date;

"(5) name of inventor(s), title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

"(6) name of inventor(s), title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number; e.g., 08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration."

Notice of July 13, 1995 (1177 O.G. 60), M.P.E.P. § 601.01(a), 6th ed., rev. 3.

(c) ☐ was described and claimed in PCT International Application No. \_\_\_\_\_, filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_ (if any).

**SUPPLEMENTAL DECLARATION (37 C.F.R. § 1.67(b))**

*(complete the following where a supplemental declaration is being submitted)*

- ☐ I hereby declare that the subject matter of the
- ☐ attached amendment
  - ☐ amendment filed on \_\_\_\_\_

was part of my/our invention and was invented before the filing date of the original application, above-identified, for such invention.

**ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

*(also check the following items, if desired)*

- ☐ and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and
- ☐ In compliance with this duty, there is attached an information disclosure statement, in accordance with 37 CFR 1.98.

**PRIORITY CLAIM (35 U.S.C. §§ 119(a)-(d))**

**NOTE:** "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by § 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. 119(b) must be filed in the case of an interference (§ 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in § 1.17(f). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. § 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT International application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT International application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

*(complete (d) or (e))*

- (d) ☒ no such applications have been filed.
- (e) ☐ such applications have been filed as follows.

**NOTE:** Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

**PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION  
AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)**

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 37 USC 119
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>
			<input type="checkbox"/> YES    NO <input type="checkbox"/>

**CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)**  
(34 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

**PROVISIONAL APPLICATION NUMBER**

**FILING DATE**

\_\_\_\_\_/\_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CLAIM FOR BENEFIT OF EARLIER US/PCT APPLICATION(S)**  
**UNDER 35 U.S.C. 120**

- ☐ The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P) APPLICATION.

**ALL FOREIGN APPLICATION(S), IF ANY, FILED MORE THAN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION**

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**NOTE:** If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete **ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION** for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

**POWER OF ATTORNEY**

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

*(list name and registration number)*

TODD N. HATHAWAY, Reg. No. 32,991

*(check the following item, if applicable)*

- ☐ I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.
- ☐ Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

---

**SEND CORRESPONDENCE TO**

**DIRECT TELEPHONE CALLS TO:**  
*(Name and telephone number)*

☒ **Address**  
TODD N. HATHAWAY  
119 N. Commercial St. #620  
Bellingham, WA 98226-4437

TODD N. HATHAWAY  
360-647-1976

☐ **Customer Number** \_\_\_\_\_

---

## DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

## SIGNATURE(S)

**NOTE:** Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

**NOTE:** Each inventor must be identified by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and by his/her residence, post office address and country of citizenship. 37 CFR § 1.63(a)(3).

**NOTE:** Inventors may execute separate declarations/oaths provided each declaration/oath sets forth all the inventors. Section 1.63(a)(3) requires that a declaration/oath, *inter alia*, identify each inventor and prohibits the execution of separate declarations/oaths which each sets forth only the name of the executing inventor. 62 Fed. Reg. 53,131, 53,142, October 10, 1997,

### Full name of sole or first inventor

WALLACE H. PETERSON  
(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)

Inventor's signature \_\_\_\_\_

Date \_\_\_\_\_ Country of Citizenship U.S.

Residence Everett, Washington

Post Office Address 5312 - 23 Avenue W.  
Everett, WA 98203

### Full name of second joint inventor, if any

\_\_\_\_\_  
(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)

Inventor's signature \_\_\_\_\_

Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_

Residence \_\_\_\_\_

Post Office Address \_\_\_\_\_

### Full name of third joint inventor, if any

\_\_\_\_\_  
(GIVEN NAME) (MIDDLE INITIAL OR NAME) FAMILY (OR LAST NAME)

Inventor's signature \_\_\_\_\_

Date \_\_\_\_\_ Country of Citizenship \_\_\_\_\_

Residence \_\_\_\_\_

Post Office Address \_\_\_\_\_

(check proper box(es) for any of the following added page(s)  
that form a part of this declaration)

☐ **Signature** for fourth and subsequent joint inventors. Number of pages added \_\_\_\_\_

\* \* \*

☐ **Signature** by administrator(trix), executor(trix) or legal representative for deceased or incapacitated inventor. Number of pages added \_\_\_\_\_

\* \* \*

☐ **Signature** for inventor who refuses to sign or cannot be reached by person authorized under 37 CFR 1.47. Number of pages added \_\_\_\_\_

\* \* \*

☐ Added page for **signature** by one joint inventor on behalf of deceased inventor(s) where legal representative cannot be appointed in time. (37 CFR 1.47)

\* \* \*

☐ Added pages to combined declaration and power of attorney for divisional, continuation, or continuation-in-part (C-I-P) application.

☐ Number of pages added \_\_\_\_\_

\* \* \*

☐ Authorization of practitioner(s) to accept and follow instructions from representative.

\* \* \*

(if no further pages form a part of this Declaration,  
then end this Declaration with this page and check the following item)

☒ This declaration ends with this page.